

DESCRIPTIONS OF SOME NEW FUNGUS-GROWING
ANTS FROM TEXAS, WITH MR. C. G. HARTMAN'S
OBSERVATIONS ON THEIR HABITS.¹

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(WITH PLATE VIII.)

During the past summer, Mr. Carl G. Hartman, of Huntsville, Texas, sent me a number of fungus-growing ants whose habits he had been carefully observing. I at first regarded the specimens as representatives of an undescribed species of the subgenus *Trachymyrmex* (genus *Atta*) but on comparing them with a large amount of material from various portions of Texas and of the United States east of the Mississippi River, I find that they represent a couple of undescribed varieties of *T. septentrionalis* MacCook. This comparison also shows that this species is far from being as uniform in its characters as has been hitherto supposed. In my paper on our fungus-growing ants¹ I did, indeed, distinguish a darker southern form of *septentrionalis* from Texas and Florida as distinct from a paler form occurring in New Jersey and the District of Columbia, and regarded the latter as the type of the species. The former was designated as var. *obscurior*. My description of the three phases of the species, however, was drawn from Texas specimens. Renewed study of the materials in my collection together with numerous specimens from several colonies received from Mr. Hartman, leads me to regard *obscurior* as a subspecies, which presents several distinct varieties. I have also found an interesting color variety of the typical *septentrionalis*. The workers and females of these different forms may be described as follows.

1. *Atta* (*Trachymyrmex*) *septentrionalis* MacCook (typical).

Worker.—Length 3–3.5 mm.

Gaster rather globose, with convex sides and faint lateral ridge on the first segment. Surface of body rather smooth, slightly shining; tubercles small and

¹ Contributions from the Entomological Laboratory of the Bussey Institution, Harvard University, No. 50.

¹ The Fungus-growing Ants of North America," Bull. Amer. Mus. Nat. Hist., XXIII, 1907, pp. 669–807, 5 pls., 31 text figs.

acute; thoracic spines slender. Color brownish yellow; borders of clypeus and frontal carinae, front and vertex, a large blotch in the dorsal impression of the postpetiole and a median dorsal stripe on the first gastric segment, dark brown or blackish.

Female.—Length 4–4.5 mm.

Resembling the worker but more coarsely sculptured. Pronotum transversely, mesonotum longitudinally rugulose. Wings opaque, infuscated; at the base yellowish along the costal margin.

New Jersey: Vineland (Mrs. Mary Treat): Toms River (Morris McCook); Lakehurst (Wheeler, W. T. Davis); Lucaston (E. Daecke); Milltown and Manasquam (Davis), Prospertown (J. B. Smith's List).

District of Columbia: Washington (Pergande, Swingle, Forel).

North Carolina: Black Mt. (Forel).

2. *A. (T.) septentrionalis* var. *vertebrata*, new var.

Worker.—Length 2.5–3.3 mm.

Differing from the typical form in its smaller size, coloration and sculpture. The dark spots and bands on the head, gaster and postpetiole are broader and more extensive, and the thorax is infuscated in the middorsal line. In some specimens the pleurae and venter are also brownish. The surface of the body is more opaque and the spines and tubercles are even smaller than in the typical form.

Female.—Differing from the female of the typical form in having the pronotum, mesonotum and petiole blotched with brown. Body opaque; sculpture as in the typical form.

Described from numerous workers and two dealated females taken by myself from a single colony at Lakehurst, N. J.

3. *A. (T.) septentrionalis obscurior* Wheeler.

Worker.—Length 3–3.5 mm.

Differing from the typical form in color, sculpture, pilosity and the shape of the gaster. The body is deep ferruginous, with slightly paler legs, the front and vertex and a usually very indistinct dorsal band or spot on the gaster, brownish. There is no dark spot on the postpetiole. The body is opaque and distinctly granular. The tubercles are all larger and more prominent and the spines on that account seem to be more robust and blunter, though not longer than in the typical form. The hooked hairs covering the body and appendages are coarser though no longer than in the type. The gaster is less globose, being flatter above and with straighter, subparallel and distinctly ridged sides.

Female.—Length 3.8–4 mm.

Resembling the worker, but the sculpture is coarser. The dark spot on the head is deeper and restricted to the ocellar region; the band on the gaster is also more distinct.

Texas: Austin (type locality), Montopolis and Milano (Wheeler);

Paris (C. T. Brues, Miss A. Rucker); Denton (W. H. Long); Palestine (F. C. Bishopp); Brownwood (W. D. Pierce).

Louisiana: Ruston (W. D. Pierce).

Illinois: Elizabethtown, Hardin County (W. P. Flint).

It is this form that Buckley may have seen and designated as *Atta tardigrada*, but, as I have shown (*loco citato*, p. 708), his description is so poor that it will apply to almost any of the Texan species of *Atta*.

4. **A. (T.) septentrionalis obscurior var. irrorata, new var.**

Worker.—Differing from the typical *obscurior* only in having the surface of the body between the spines and tubercles covered uniformly with dense, gray granules. In size and in the development of the spines and tubercles the specimens are essentially like those of the typical form of the subspecies.

Described from many workers taken from six colonies at Huntsville, Texas, by Mr. C. G. Hartman.

5. **A. (T.) septentrionalis obscurior var. crystallina, new var.**

Worker.—Differing from the typical *obscurior* only in having the body covered with a layer of minute crystalline particles, probably an excretion.

The female and male resemble the corresponding phases of the typical *obscurior* in lacking this layer of particles.

Described from several hundred workers, four males and a few dozen winged females taken from five colonies at Huntsville, Texas, by Mr. C. G. Hartman.

6. **A. (T.) septentrionalis obscurior var. seminole, new var.**

Worker and Female.—Differing from the typical *obscurior* in their somewhat larger average size (worker 3.5–4 mm.; female 4.5–5 mm.), decidedly rougher integument and the stouter tubercles and spines. The dark brown markings on the head and gaster are more distinct and there is a spot of the same color in the dorsal impression of the postpetiole. In the female the region in front of the ocellar spot is also dark brown.

Male.—Like that of the male *obscurior* but averaging somewhat larger.

Florida: Miami (Wheeler).

Other specimens marked "Florida," collected by Pergande and received some years ago from Dr. Gustav Mayr, evidently belong to the same variety.

Further study of *T. septentrionalis* may show that the varieties *irrorata* and *crystallina*, which I have based merely on peculiar surface appearances, are inadmissible, for these appearances may be

characteristic of a purely temporary physiological condition. They may be modifications of the bluish bloom often found covering specimens of *Trachymyrmex* and *Cyphomyrmex* and apparently analogous to the waxy secretion covering the bodies of senescent dragon flies and the surface of Rynchophorous beetles of the genus *Lixus*.

Among the material collected by Mr. Hartman during September, 1911, I find a couple of workers representing the following subspecies of *T. turrifex*, a species which has been taken heretofore only in the dry central and western portions of Texas:

A. (T.) turrifex Wheeler subsp. caroli, new subspecies.

Worker.—Length 2.5–2.8 mm.

Differing in its smaller size from the typical *turrifex*, which measures 3–3.75 mm. and in coloration, the whole body with appendages being brownish yellow, with the front and vertex infuscated. The hooked hairs covering the body and appendages are neither coarser nor more abundant than in the typical form, but their dark brown color, contrasting with the pale integument, makes them more conspicuous. The tubercles are very small and acute, especially on the gaster. This region lacks the median longitudinal impression and lateral ridges, which though feebly developed, are nevertheless distinct in the typical form.

Described from two specimens taken from the same colony at Huntsville, Texas, by Mr. C. G. Hartman. This form evidently represents a depauperate, arenicolous race ranging considerably eastward of the typical *turrifex*.

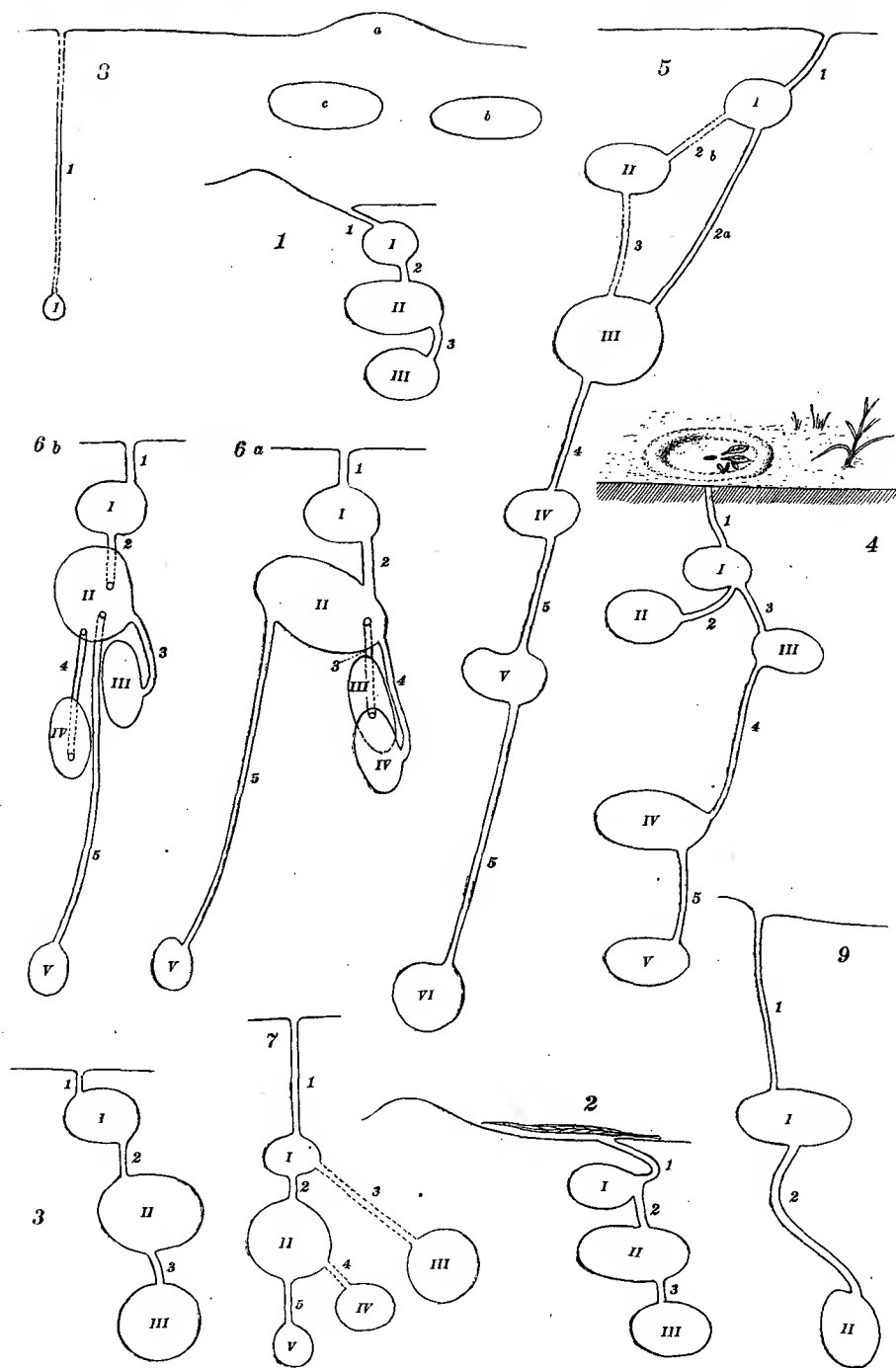
The following table will assist in distinguishing the various forms described above as well as the other known species and varieties of the subgenus *Trachymyrmex* from North, South and Central America:

1. Antennal scape furnished with a lobe at the base.....2
 Antennal scape without a lobe at the base3
2. Lobe of antennal scape long and narrow; posterior angles of head usually acute; surface of body scabrous, not pruinose. Length 3.25–4.5 mm. Rio Grande do Sul.....*iheringi* Emery.
 Lobe of antennal scape short and broad; posterior angles of head obtuse; surface of body smoother, pruinose. Length 3.2–4 mm. Buenos Aires. *pruinosa* Emery.
3. Preorbital carina not curved mesially behind nor crossing the antennal scrobe, but continued backward to the posterior corner of the head.....4
 Preorbital carina curved inward and entering the antennal scrobe, or at any rate, not extending to the posterior corner of the head.....10
4. Antennal scapes not extending beyond the posterior corner of the head...5
 Antennal scapes extending beyond the posterior corners of the head.....7

5. Body covered with white scales in addition to the hooked hairs; first gastric segment depressed above, compressed on the sides, subtruncate and bigibbous behind. Length 4.5 mm. Para.....*farinosa* Emery.
Body not covered with white scales; first gastric segment not bigibbous behind6
6. Color ferruginous; gaster with feebly developed median dorsal impression and lateral ridges. Length 3-3.75 mm. Texas.....*turrifex* Wheeler.
Color brownish yellow; gaster without median dorsal impression or lateral ridges. Length 2.5-2.8 mm. Texas....*turrifex* subsp. *caroli* subsp. nov.
7. Thorax and gaster between the tubercles and ridges covered with numerous small whitish scales. Length 4 mm. Costa Rica....*squamulifera* Emery.
Thorax and gaster without whitish scales.....8
8. Posterior corner of head in profile with two spines; inferior pronotal spine acute; first gastric segment with a deep median and two somewhat shallower lateral, longitudinal impressions.....9
Posterior corner of head in profile with three spines; inferior pronotal spine obtuse; first gastric segment without deep longitudinal impressions.
Length 3.8-4 mm. São Paulo.....*oetkeri* Forel.
9. Color yellowish ferruginous, with the head, venter and a median longitudinal stripe on the first gastric segment, brown. Length 4 mm.
Trinidad*urichi* Forel (typical).
Color dark brown, with slightly paler legs and scapes. Length 3.5-4 mm.
Matto Grosso*urichi* var. *fusca* Emery.
10. Preorbital carina but little deflected posteriorly into the antennal scrobe; posterior corner of head in profile with two prominent, widely separated spines; pronotum without median spines; first gastric segment with three broad and rather deep, longitudinal impressions. Color deep ferruginous, with the gaster, most of the head and portions of the thorax and legs, black. Length 3.5-4.5 mm. Jamaica, St. Vincent, Culebra I. Bahamas.
jamaicensis Ern. André.
- Preorbital carina curved mesially behind and continued some distance over the antennal scrobe; posterior corner of head in profile with a single small, simple or bifid spine and several tubercles; pronotum with a pair of median spines or bifid tubercles; first gastric segment without longitudinal impressions. Color yellowish brown or ferruginous with the infuscations restricted to spots on the head and gaster or, more rarely, on the thorax.....11
11. The three pairs of lateral spines of the pro- and mesonotum short, blunt and of similar shape, being projections rather than spines. Length 2.5-3.5 mm. Arizona.....*desertorum* Wheeler.
The three pairs of lateral spines of the pro- and mesonotum of different shapes, the first pair being decidedly longer and more pointed than the others12
12. Median prothoracic spines acute, nearly as long as the lateral pair; mesonotum with two pairs of subequal spines; petiole $1\frac{1}{2}$ times as long as broad; first gastric segment with only about fifty tubercles on its dorsal

- surface and these acute and prominent. Length 2.8–3.5 mm. Guatemala and British Honduras.....*intermedia* Forel.
- Median prothoracic spines short, blunt and usually bifid, much shorter than the lateral pair; mesonotum with two unequal pairs of spines, the anterior pair often reduced to mere tubercles; petiole less than $1\frac{1}{2}$ times as long as broad; tubercles on the dorsum of the first gastric segment (except in *saussurei*) more numerous and less prominent13
13. Larger species (3.5–5 mm.) with robust spines and prominent tubercles; mesonotum in front with two pairs of spines, the anterior small and tuberculiform14
- Smaller species (2.5–4 mm.) with more slender spines and less prominent tubercles; mesonotum in front with a single multifid blunt spine or projection15
15. Sides of head rather straight and subparallel; tubercles on gaster dense and numerous; epinotal spines stouter, directed backward; color ferruginous red; hairs on legs coarse and erect. Arizona. *arizonensis* Wheeler.
- Sides of head convex; tubercles on gaster larger, sparser and fewer in number; epinotal spines more slender, directed upward; color yellowish brown; hairs on legs less coarse, reclinate. Mexico.....*saussurei* Forel.
15. Color brownish yellow; surface of body rather smooth, slightly shining..16
- Color ferruginous; surface of body opaque and granular.....17
16. Only the front, vertex, a median spot on the postpetiole and a median longitudinal stripe on the first gastric segment black. New Jersey.
- septentrionalis* McCook (typical).
- Dark markings on the head and gaster more extensive and in addition a dark median longitudinal band on the thorax. New Jersey.
- septentrionalis* var. *vertebrata* var. nov.
17. Surface of body not covered with gray granules or glistening particles. Texas.....*septentrionalis* subsp. *obscurior* Wheeler (typical).
- Surface of body covered with gray granules or glistening particles.....18
18. Body covered with glistening particles. Texas.
- septentrionalis obscurior* var. *crystallina* var. nov.
- Body covered with small gray granules.....19
19. Thoracic spines small and slender. Texas.
- septentrionalis obscurior* var. *irrorata* var. nov.
- Thoracic spines longer and more robust; sculpture coarser. Florida.
- septentrionalis obscurior* var. *seminole* var. nov.

In my paper on the North American fungus-growing ants I described the habits of the typical *T. obscurior* of Austin, Texas, and gave measurements and figures of its nests. Mr. Hartman has sent me all his notes on several colonies of the varieties *irrorata* and *crystallina*. Although he did not distinguish between these varieties in the field, it is probable that they do not differ appreciably in habits



Nests of *Trachymyrmex obscurior*.

either from each other or from the typical *obscurior*. The observations are, nevertheless, well worth publishing, both because they were made with care and in a new locality, and because our knowledge of the North American *Atti* is still fragmentary. I am glad, therefore, to append his notes on the general habits of the two varieties and on nine of their nests, which he studied in detail, together with a table of measurements and a plate of figures of their galleries and chambers (Plate VIII). In the figures the chambers are designated by Roman, the galleries by arabic numerals.

"*Trachymyrmex obscurior* is found in the sandy woods about Huntsville, on the divide between the Trinity and San Jacinto Rivers at an altitude of about 360 feet above sea-level. The flora of these sandy woods consists of post-oak (*Quercus minor*), black jack (*Q. Marilandica*), blue jack (*Q. brevifolia*), hickory (*Hicorea villosa*), short-leaf pine (*Pinus echinata*), loblolly pine (*P. tæda*), French mulberry (*Callicarpa americana*) and bull-nettle (*Iatropa stimulosa*). Hymenoptera (*Pompilus*, *Bembex*, *Sphex*, Mutillids, Scoliids, ants, etc.), abound in this locality. Mole burrows are common. Here also occurs another fungus-growing ant, *Atta* (*Mycetosoritis*) *hartmani* Wheeler, thus far reported only from the sandy floral and faunal island at Montopolis, below Austin, Texas. This island has affinities with the Carolinian region and these affinities are even more apparent in the Huntsville locality, owing to its having a much greater number of eastern species of plants and animals.

"I have seen *T. obscurior* only in sandy soil, and she does not burrow into the underlying clay. When the sand is shallow, the chambers of the nest will be reduced in number and increased in size (nests 1 and 2) and crowded close together by a shortening of the connecting galleries.

"May and June are the months most favorable for observing the activities of the ants. At this season all the chambers, including the uppermost one, contain flourishing, pendent fungus-gardens. The soil is moist near the surface, but later, as it dries out, the upper chambers are abandoned and the ants retreat to the lower chambers which lie in soil that is probably moist throughout the year. As late as August 29 I found an excellent fungus-garden (but not containing pupæ) at a depth of 12 inches. The shade of the trees prevents the heating of the ground to a very great depth.

"In habits *T. obscurior* scarcely differs from the other species of the subgenus. The workers are sluggish in their movements and 'play possum' or 'feign death' like their congeners. Caterpillar excrement is used for the substratum of the fungus-gardens. At the beginning of the season (May and June) work is carried on both day and night, but later the ants come forth only at night, except on cloudy days, after a rain the night before, when a few individuals may occasionally be seen outside the nest. (August 29 *e. g.*) On July 24 at 8:30 A. M. I saw a few ants at a single nest, and these all seemed to be coming in. August 5 at 9 P. M. I made the rounds of five nests and found individuals abroad at three of them. At one they were out in large numbers. The light of my lantern threw them into great excitement.

"During 1911 the marriage flight took place in June. On July 22 I found nest 8 which I believe had been excavated by a queen fecundated during this summer. Very little excavating was done after July 1.

"The surface portion of the *obscurior* nest is typically a crescentic crater, several inches high at its highest point, with the entrance corresponding to the center of a circle of which the crescent is an arc. Nest no. 4, which had a circular crater, and nest no. 3, with a simple conical crater, were exceptions, or rather variations from the type. The entrance is usually concealed under vegetable debris, as is often the case in nests of other fungus-growing ants. The number, shape and size of the chambers and the length, direction and method of branching of the galleries are very variable, as will be seen from the accompanying figures. I give herewith a table of dimensions of the chambers (length, breadth and thickness) and of the galleries (length), together with the depth of the floor of the lowermost chamber below the surface. The chambers and galleries are numbered in sequence as in Wheeler's paper, "The Fungus-growing Ants of North America." My measurements in the field were recorded in the English instead of the metric system, but in the table these measurements have been reduced to millimeters, so that they may be readily compared with those in Wheeler's table. The following notes on the individual nests are added as an aid in interpreting the figures of the plate:

"Nests 1 and 2.—(May 31.) At the foot of a sandy knoll. The

TABLE OF MEASUREMENTS (IN MM.) OF NINE NESTS OF *Trachymyrmex obscurior* (TWO VARS.).

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sand here was very shallow and underlain by tough, red clay. As the ants did not, so far as I observed, excavate in the clay, they contented themselves with making a few large chambers near the surface. Nest 1 was 13 cm. (5 in.), nest 2, 15 + cm. (6 in.) deep. Each chamber of these nests was filled with a flourishing fungus-garden. The number of ants in each colony seemed to be below the average.

"*Nest 3.*—(About the middle of June.) This nest was excavated in deeper sand (2 ft. to red clay) than nests 1 and 2, and was found near nest 5, the deepest of all. Perhaps I missed the lowermost chamber. The uppermost was only 13 mm. ($\frac{1}{2}$ in.) below the surface, the lowermost 20.5 cm (8 in.). Ch. I contained dried, yellow remains of a fungus garden; Ch. II and Ch. III splendid gardens, all suspended from the ceiling by rootlets left for the purpose. Both Ch. II and Ch. III were used as brood chambers, especially Ch. III which was almost choked with fungus, workers, males, winged females and young in all stages. The exact number of individuals taken was as follows: 376 workers, 92 mature males and females, 215 pupæ. There were also many larvæ, mostly large and well developed. The crater of this nest was not of the crescentic form, but was merely a conical pile of sand situated several inches to one side of the entrance.

"*Nest 4.*—(May 31.) This nest had a low crater in the form of a perfect circle around the entrance as shown in the figure. The entrance, as usual, was concealed under leaves and other débris. The workers were carrying in caterpillar excrement. Fungus-gardens were found in all the chambers.

"*Nest 5.*—(Middle of June.) This was the deepest nest found, Ch. VI being 66 cm. (26 in.) below the surface of the sand. The chambers were of the vertically flattened type except Ch. VI which was spherical (comp. nests 3, 5, 6 and 7). Ch. V had an accessory pocket on one side, probably due to the unfinished excavation of the roof of the chamber. Gal. 2a, could be plainly followed but Gal. 2b and 3 only in part. My notes state that I was tolerably certain of the courses of Gal. 3 but not of 2b. It would seem that the ants must have had more use for Gal. 2b than for Gal. 3. A fungus-garden was found in each of the chambers. The sand was very damp below.

"*Nest 6.*—(June 26.) Of this nest, which was of the compound

racemose type, I give two figures, one in a plane perpendicular to the other. It was the most singular nest examined. Ch. II had coming off from it Gals. 3, 4 and 5. The shape of the chambers was peculiar in that their long axes were oblique (Ch. III) or more or less vertical (Ch. III, V and VI). Ch. V extended down to a depth of 25.5 cm. (10 in.). Very little fungus was found and not more than fifty workers. The gardens were evidently worn out. Several winged forms appeared and a few larvæ and pupæ were taken from Ch. IV and V. It is probable that I missed a chamber somewhere below Ch. V.

"Nest 7.—(July 20.) Undoubtedly a nest of the racemose type. I could not, however, satisfy myself in regard to the relations of Ch. III and IV to the remainder of the nest. Ch. I contained a few ants but no fungus gardens. Two mother queens came up into this chamber after I had begun to excavate. The workers, too, seemed anxious to get away. Gal. 1 was 6 mm. ($\frac{1}{4}$ in.) in diameter. Ch. II and III were full of dark colored fungus-gardens. Ch. IV contained a normal garden and brood, and in Ch. V there was a little fungus piled high and full of white pupæ. The ants had done no excavating between July 8 and July 20.

"Nest 8.—(July 22.) The crater *a* of the figure was recognized as that of a *Trachymyrmex* nest and on digging under it I came upon Ch. *c* and *d*, which evidently belonged to an abandoned nest. Continuing the excavation with care, I found a small chamber 13 mm. ($\frac{1}{2}$ in.) in diameter and about 18 cm. (7 in.) below the surface. It contained a small fungus-garden, a mother queen and five or six workers. The latter were light colored and evidently young. There were also several pupæ. I believe that this must have been an incipient nest and the queen therefore young and recently fecundated.

"Nest 9.—(August 29.) Excavated on a morning after a generous rain the day before. Several ants were seen near the entrance. The soil had been moistened by the rain to a depth of 13 cm. (5 in.); lower down it looked very dry but felt slightly moist and cool, although it was not wet enough to "ball up" when squeezed in the hand. Ch. I contained a few workers and Gal. 2 was full of them and of a rather old-looking fungus-garden. Ch. II contained a flourishing garden suspended from the ceiling but was not of the bright color seen in gardens unearthed during the spring. A few pupæ and several light-colored workers were observed."